Exhibit
Catalogue

TRANSFORMATION OF ENERGY

NATIONAL COUNCIL OF SCIENCE MUSEUMS

Mobile Science Exhibits

TRANSFORMATION OF ENERGY

designed and developed
in 1966. at

BIRLA INDUSTRIAL & TECHNOLOGICAL MUSEUM
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NATIONAL COUNCIL OF SCIENCE MUSEUMS
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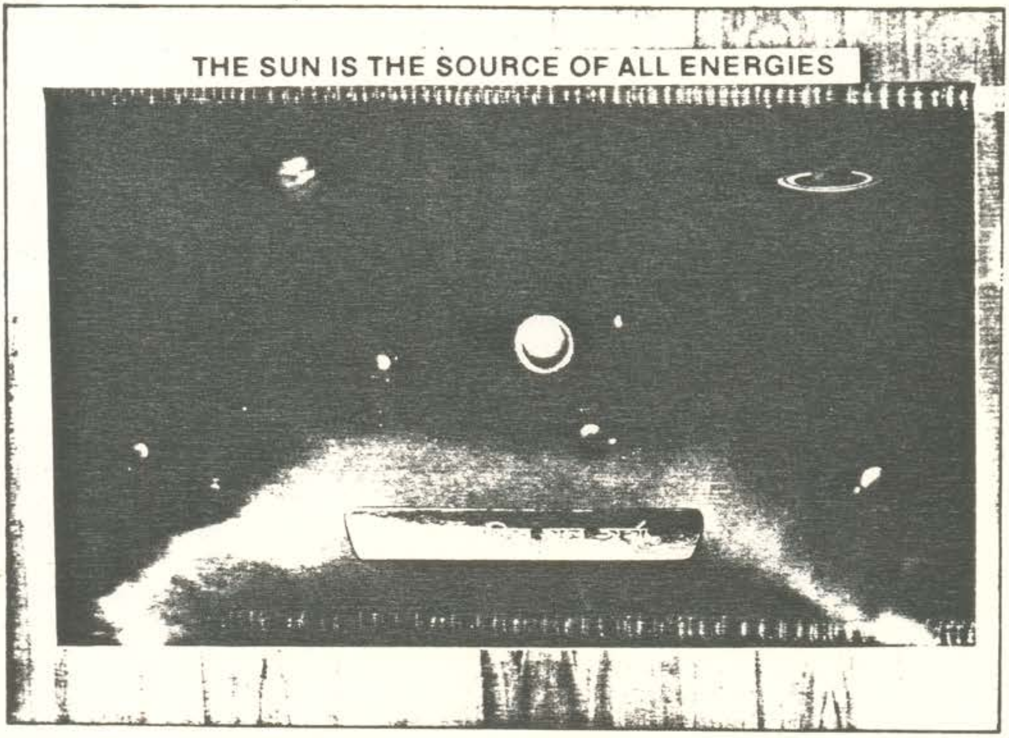
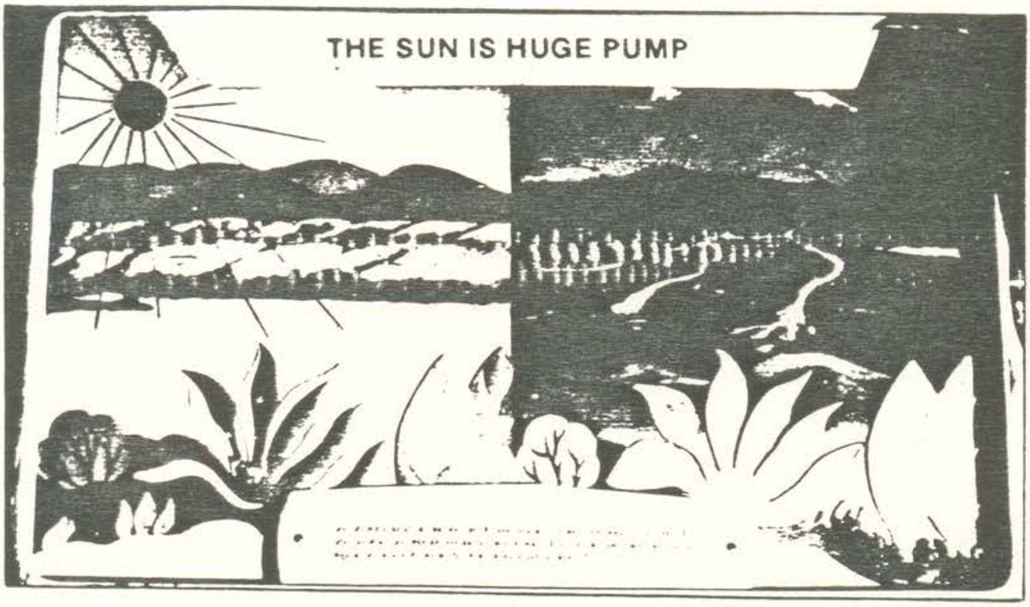
Exhibit No. 1 : The Sun Is The Source Of All Energies



The sunrays that reach the Earth in the form of light and heat create and maintain the weather cycle. Bioconversion of solar energy takes place in green leaves of trees during photosynthesis. The fossil fuels that we burn today are the products of the vegetation and living organisms that existed on Earth millions of years ago. Thus all our energy sources have one origin - the Sun.

Here, with Sun as centre, the Earth together with other planets in their respective sizes and rotational positions along the orbits are shown.

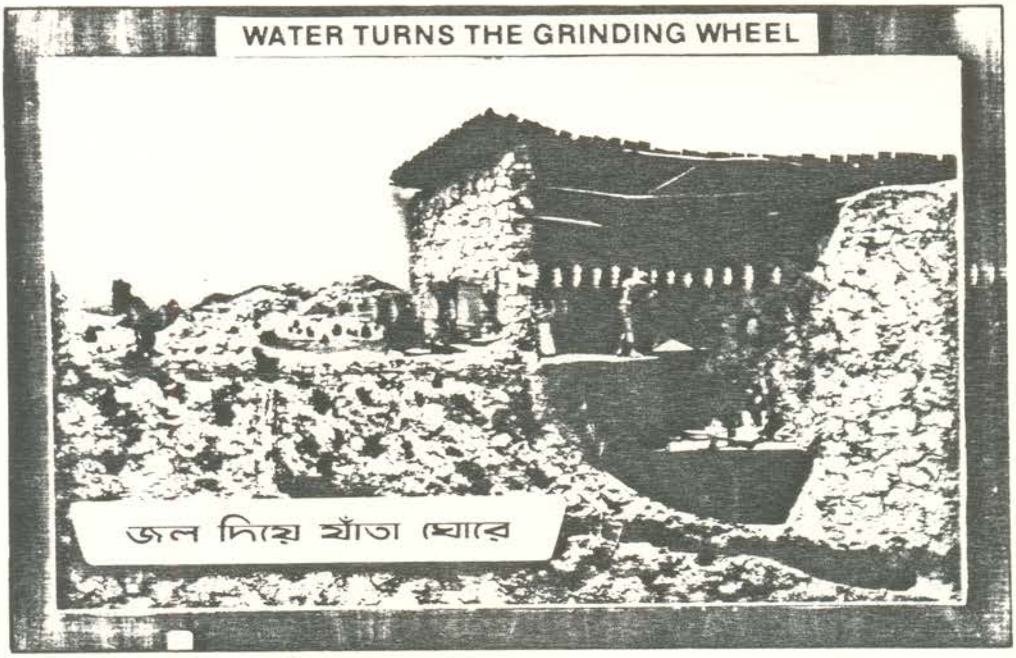
Exhibit No. 2 : The Sun Is A Huge Pump


THE SUN IS HUGE PUMP

Water, the chief constituent of living things, is ceaselessly flowing down inclined plains to the oceans. The store of water on the land would thus have been exhausted. But the water of the oceans, evaporating under the scorching rays of the Sun, is forming clouds and falling again on Earth in the form of rain.

Here the animated exhibit shows how Sun acts as a pump.

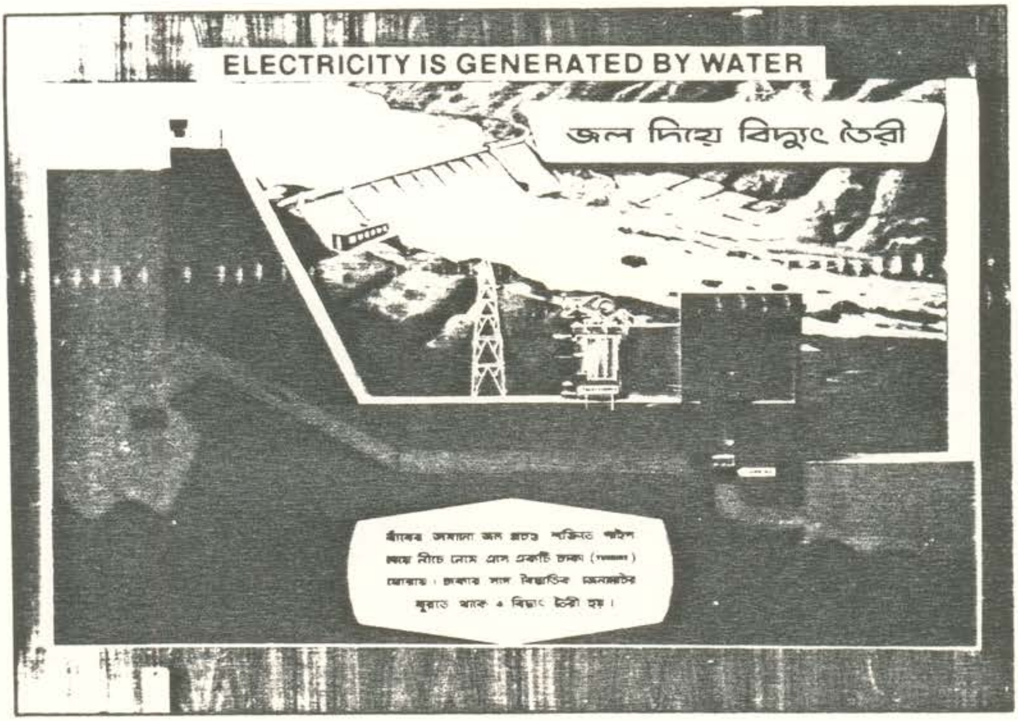
Exhibit No. 3 : Water Turns The Grinding Wheel



Flowing water has energy that drives water wheel which again helps to drive a grinding mill. Thus energy from flowing water is transformed into mechanical work.

In this working model, how a grinding mill is operated by the motive power coupled by a water wheel after its rotation by the flowing water is displayed.

Exhibit No. 4 : Electricity Is Generated By Water



The stored water in the dam runs down the pipe with enormous force and turns a turbine. The turbine rotates an electric dynamo attached to it and electric current is generated.

In this model, there is an animation showing how flowing water rotates a turbine to generate electricity.

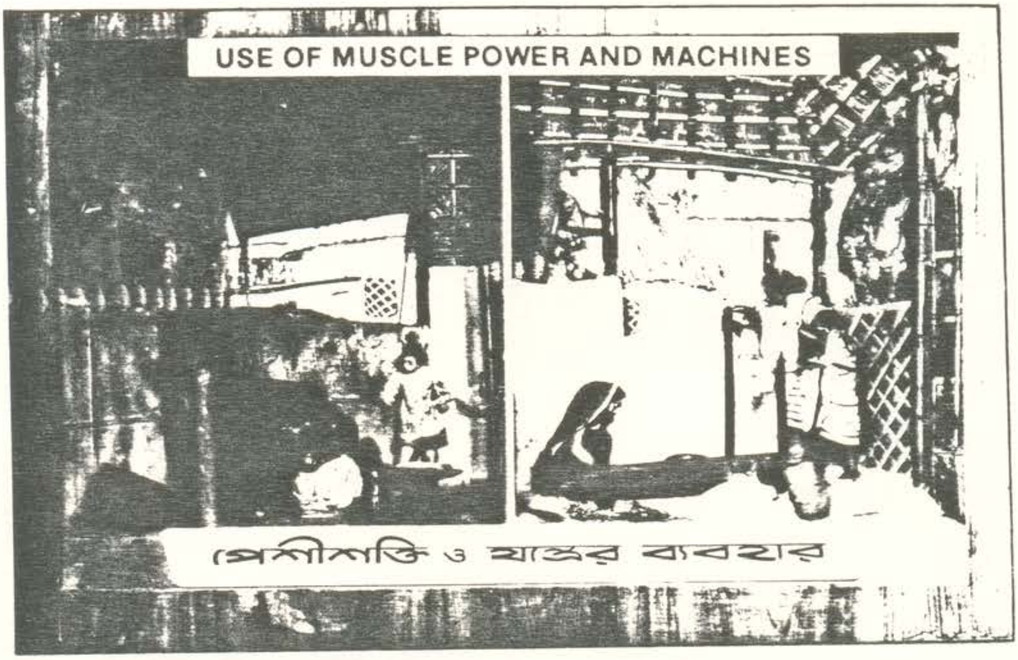
Exhibit No. 5 : Wind Drives The Boat, Turns The Wheel

WIND DRIVES THE BOAT, TURNS THE WHEEL
বাতাসে নৌকা চলে, চাকা ঘোরে

Wind, the movement of the air, is produced as air is alternately cooled and heated by the direct impact of solar radiations. Wind energy is highly irregular and cannot be normally used for industry. However the oldest and most widely used application of wind power was in the wind driven boats and sailing ships. Chinese first used the wind-wheels to supply cheap power.

Here the exhibit shows how the wind pushes the boats along on a breezy day and how the wind acts on inclined vanes of the wind mill to create rotation for operating a water pump or electric generator.

Exhibit No.6 : Use of muscle power and machines


USE OF MUSCLE POWER AND MACHINES
পেশীশক্তি ও যন্ত্রের ব্যবহার

Every living organism is a consumer of energy, since animal life depends on metabolism fuelled by food, which supplies the necessary amount of energy to the body, needed for doing muscular and mental work. Muscular work done by labourers, housewives, slaves and draught animals contributes the greatest part to the total needs of mechanical work among civilized as well as primitive people to our time. Therefore manpower and animal power are integral parts of energy that will make a sharp distinction between animate or physiological energy by food and fodder and inanimate or purely physical energy fed by fuel, wind, water power etc.

Here the exhibit shows practically how the muscle powers are utilized by a blacksmith and a village housewive for the operation of their machines, the bellow and the pedal for cleaning rice.

Exhibit No.7 : We get power by burning coal

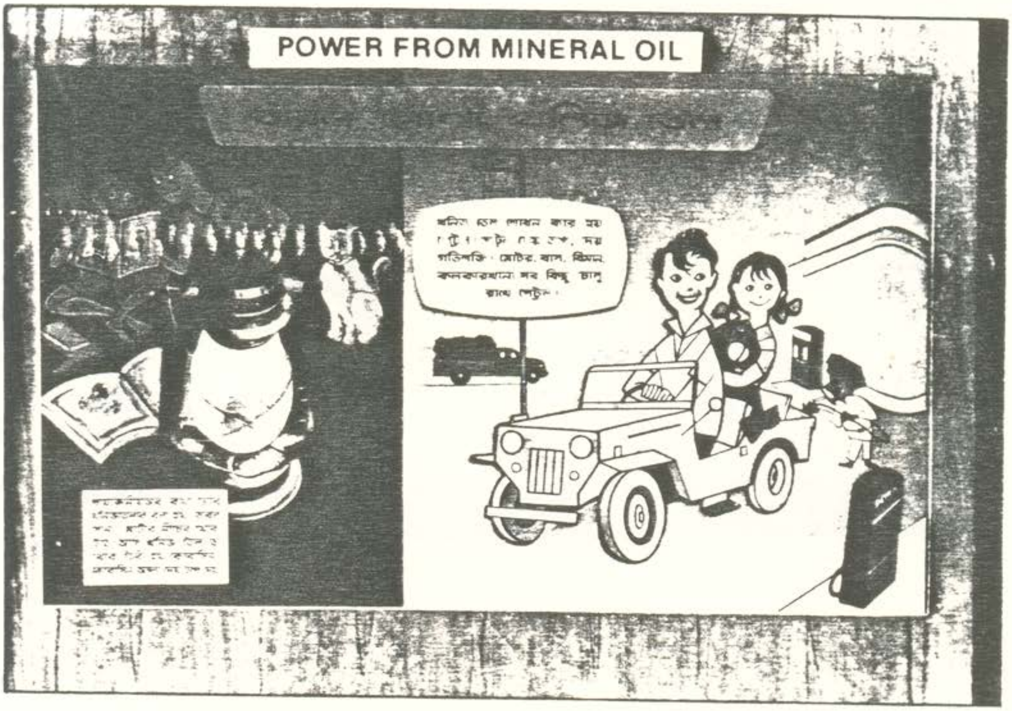
WE GET POWER BY BURNING COAL
কয়লা পুড়িয়ে শক্তি পাই

The heat obtained by burning coal is used for cooking our meals, driving the railway train and running our factories' machines.

Coal produces a kind of gas. By burning this gas we cook our meals, burn lamps and run factories.

This exhibit gives us these ideas by light animation.

Exhibit No. 8 : Power From Mineral Oil

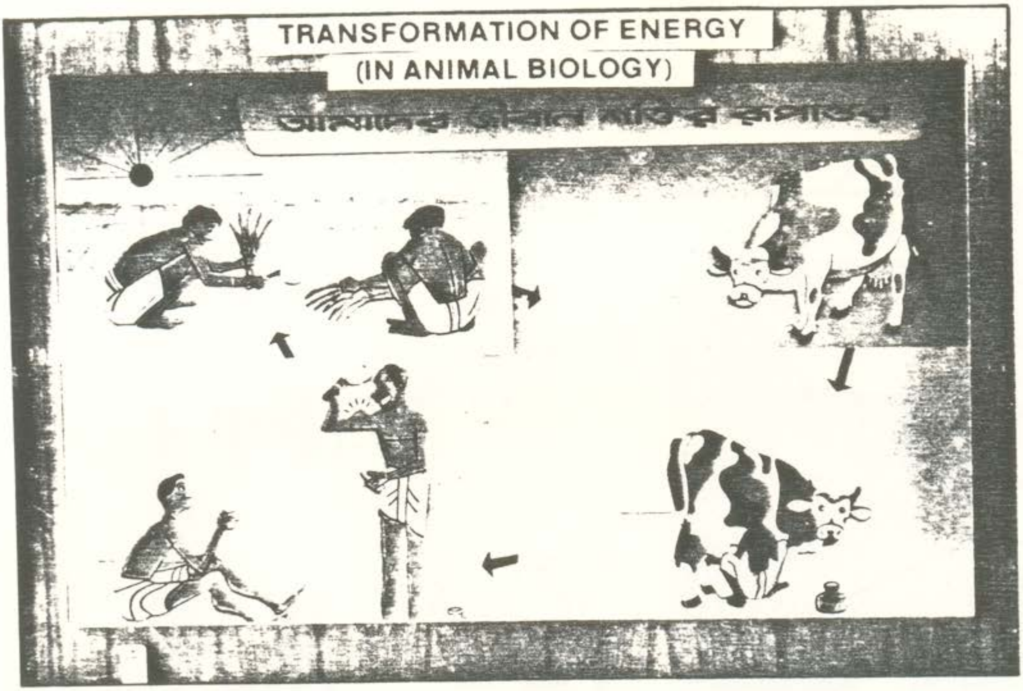


We call mineral oil 'liquid gold' on account of its usefulness. Mineral oil (Petroleum) comes from the interior of the Earth. Kerosene is produced from it. It gives light and heat.

We get petrol from mineral oil by the process of fractional distillation. Petrol gives heat and motive power. Petrol drives motors, buses, aeroplanes, factory machines etc.

This light-animated exhibit shows all these.

Exhibit No.9 : Transformation Of Energy (in animal biology)



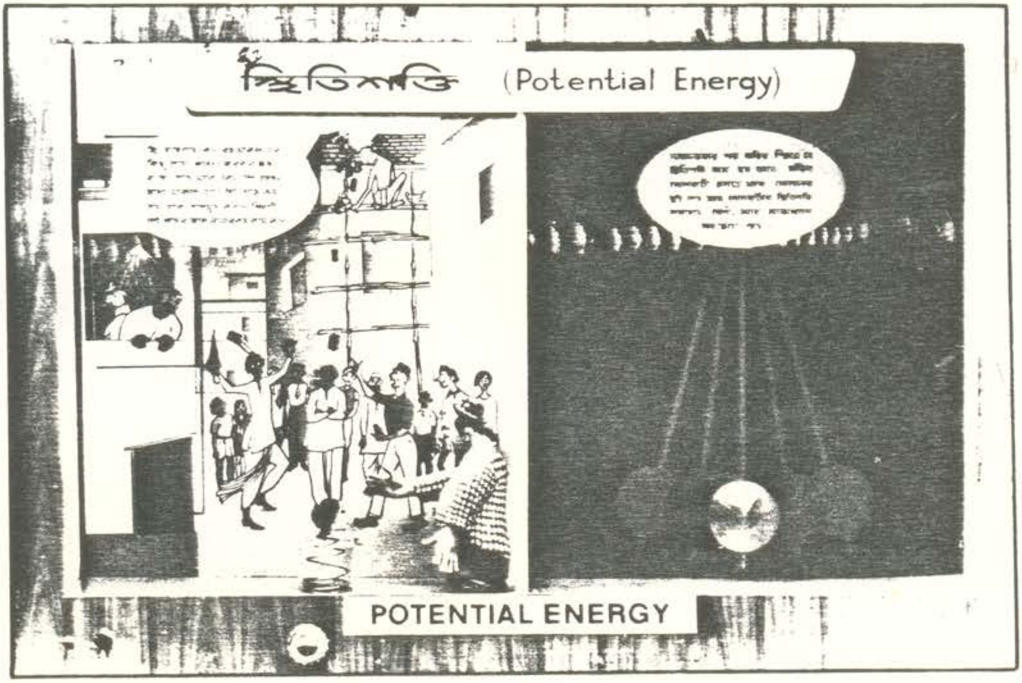
Life is basically, a problem of organic structure. To maintain this structure, the organism must continuously exchange energy with the surroundings.

By photosynthesis green plants absorb energy from the Sun to form carbohydrates. It is thus a transformation of solar into biochemical energy.

To exist, grow and multiply all living beings, animals or vegetables, need organic food which are used as constituent elements and as source of energy.

Here by the light animation of the exhibit we get a very clear picture of these ideas in a cyclic order.

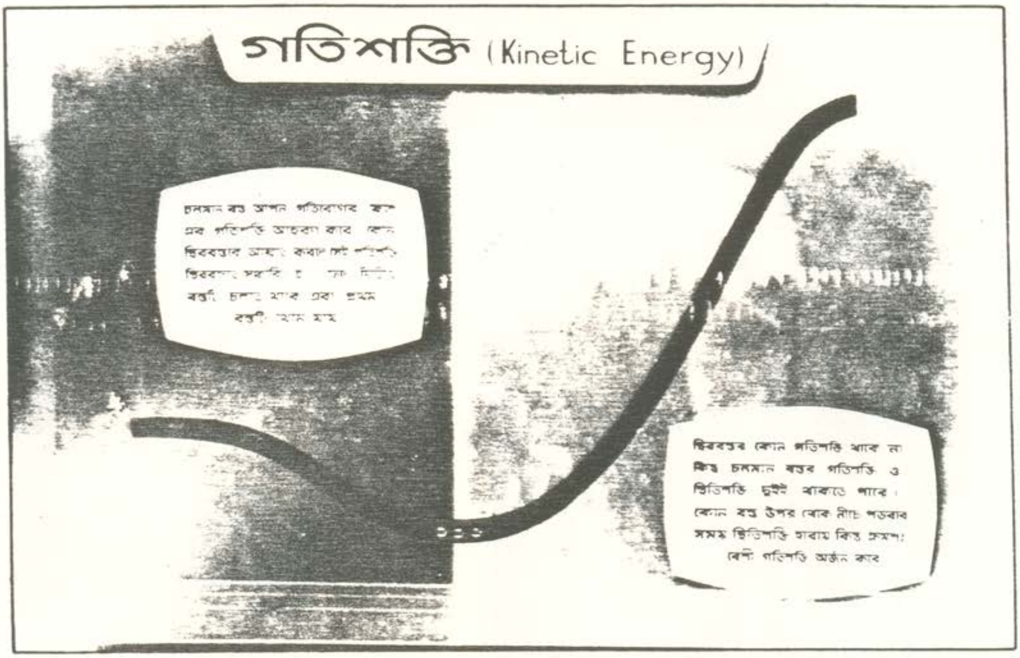
Exhibit No.10 : Potential Energy



When a body is placed at a height, it possesses potential energy to do work. Potential energy is stored in a spring when compressed and on releasing pressure the spring can do work by spending the stored potential energy.

The exhibit also shows how the pendulum of a clock is driven by means of the energy stored in wound up spring. Energy is maximum at the extreme points of its oscillation and minimum at the middle.

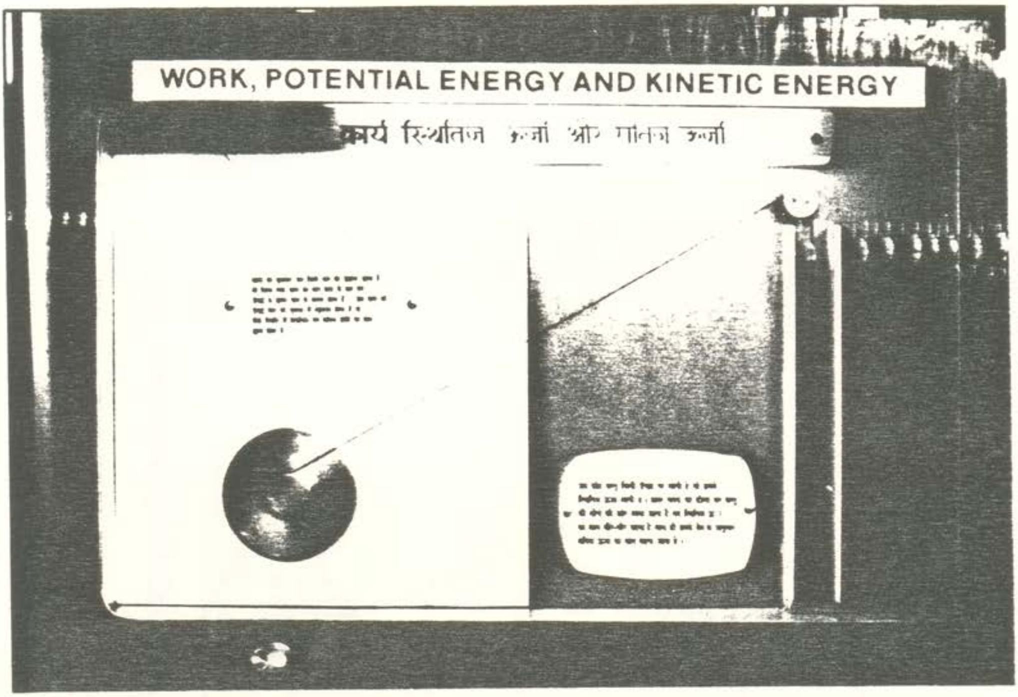
Exhibit No. 11 : Kinetic Energy


গতিশক্তি (Kinetic Energy)
স্থিরবস্তুর কোন গতিশক্তি থাকে না
কিন্তু চলমান বস্তুর গতিশক্তি ও
স্থিতিশক্তি দুইই থাকতে পারে।
কোন বস্তু উপর থেকে নীচে পড়বার
সময় স্থিতিশক্তি হারায় কিন্তু ক্রমশঃ
বেশি গতিশক্তি অর্জন করে

A moving body possesses Kinetic energy by virtue of its motion. If it strikes a body at rest, it transfers the kinetic energy to the other. As a result the second body begins to move and the first comes to rest.

A body at rest has no kinetic energy, but a body in motion may have both potential and kinetic energy. A falling body loses potential energy gradually and gains more and more kinetic energy.

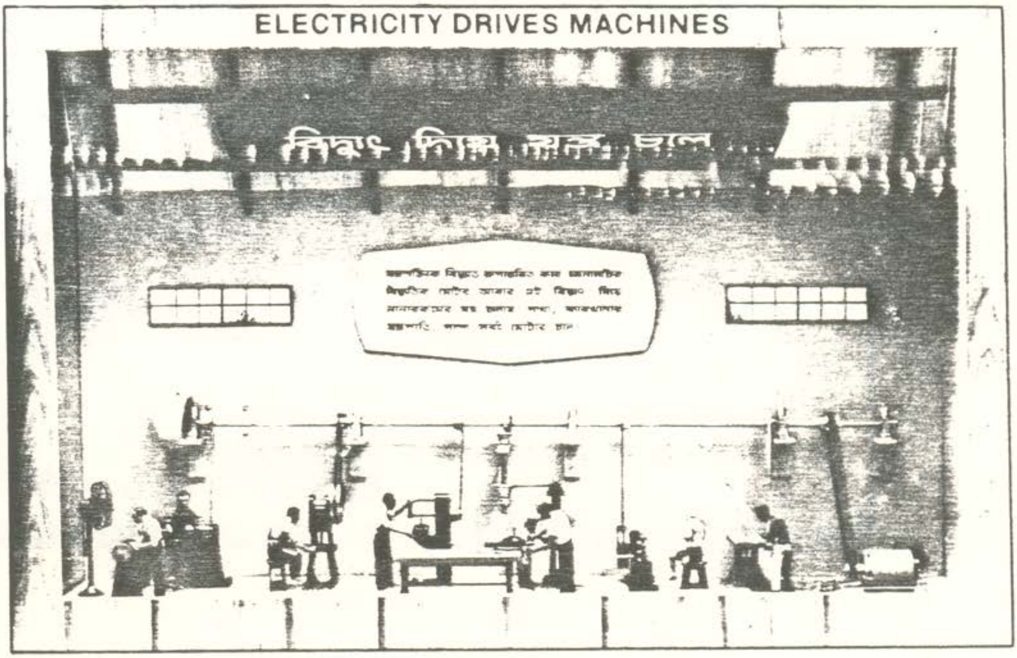
Exhibit No. 12 : Work, Potential Energy And Kinetic Energy


WORK, POTENTIAL ENERGY AND KINETIC ENERGY
कार्य स्थितिज ऊर्जा और गतिज ऊर्जा

In this exhibit, when the weight (W) is raised to a certain height (H) by turning the knob, the work done is measured by W x H and when the weight is at the bottom, it has neither potential energy nor kinetic energy.

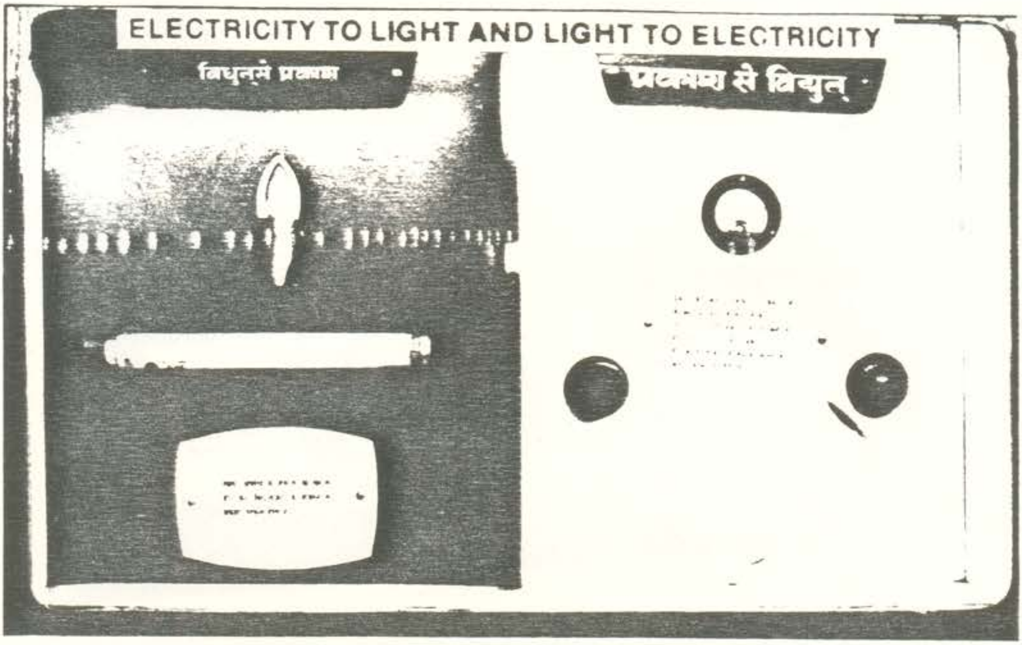
The weight gains potential energy when raised. While descending, the weight gradually loses potential energy but gains in kinetic energy due to increase in velocity.

Exhibit No.13 : Electricity drives machines



An electric motor transforms electrical energy into mechanical energy. How a master motor drives fans, pumps and various types of machines in factories with the help of power transmission arrangements, by using electrical energy from one point, is practically demonstrated in this exhibit.

Exhibit No.14 : Electricity to Light and Light to Electricity



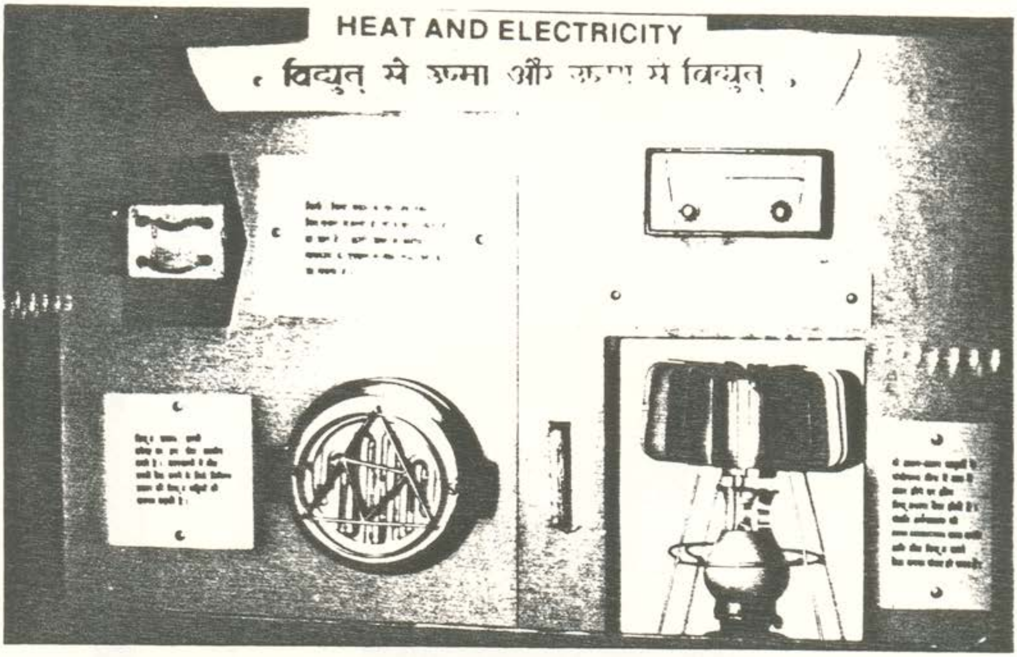
Light is produced if electric current is passed through a wire or a gas under some special conditions.

By pressing a switch this can be seen here.

Photo-electric cell converts light energy into electrical energy and the invention of photo-cells has made talkie films possible.

Here the exhibit also shows how light rays falling on a photo-cell is transformed into electricity.

Exhibit No. 15 : Heat And Electricity



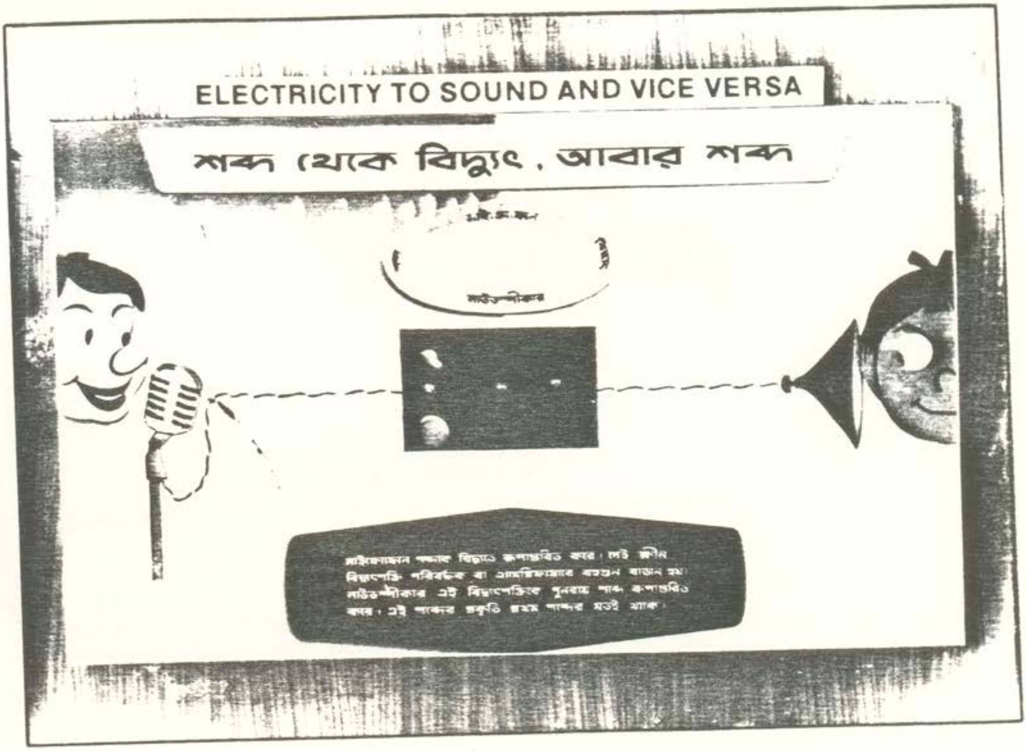
Some types of metal wire become intensely hot when electric current is passed through them. By using coils of nichrome wire, intense heat can be produced in a small space.

A feeble electric current is produced if a temperature difference exists between junctions of two different metals. Now, it has been possible to produce electric energy of high intensity by heating semi-conductors by a kerosene lamp.

This can be seen when a radio plays inside the exhibit.

Electric heaters, irons etc. are daily used by us. To get intense heat various kinds of electric furnaces are required in factories.

Exhibit No.16 : Electricity to Sound and Vice Versa


ELECTRICITY TO SOUND AND VICE VERSA
শব্দ থেকে বিদ্যুৎ, আবার শব্দ

This exhibit shows how a microphone transforms sound into feeble electricity which is multiplied many times in an amplifier, and a loudspeaker transforms this amplified electrical energy into sound again. Here the characteristics of this sound remain the same as before.

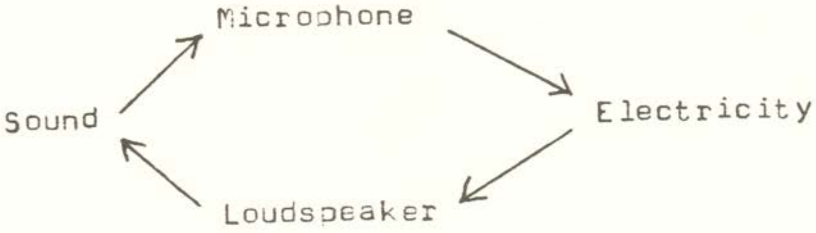
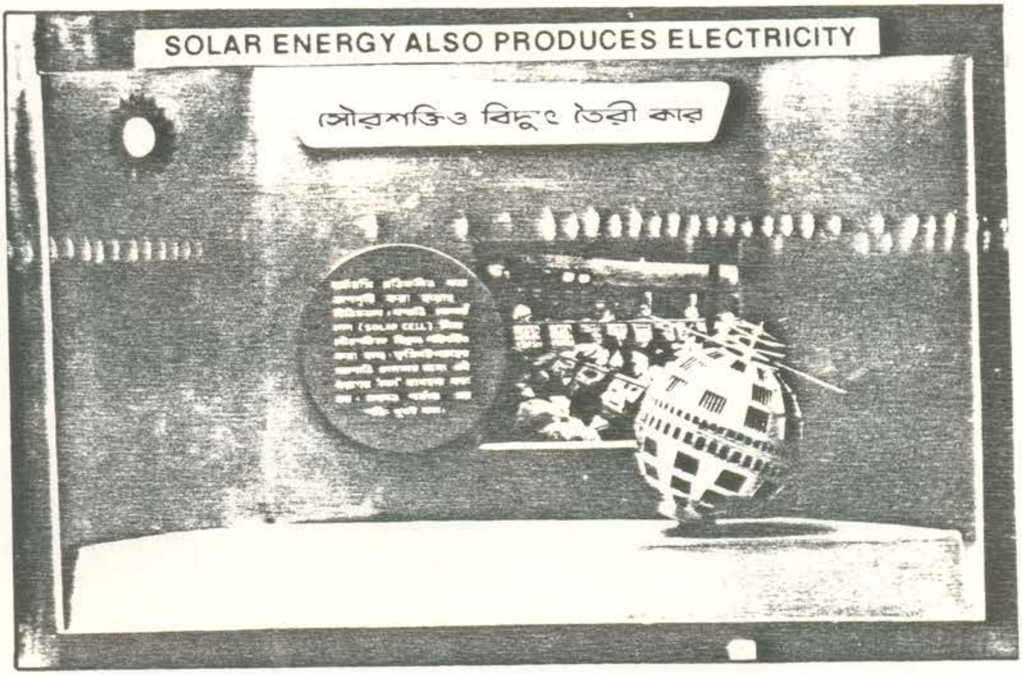
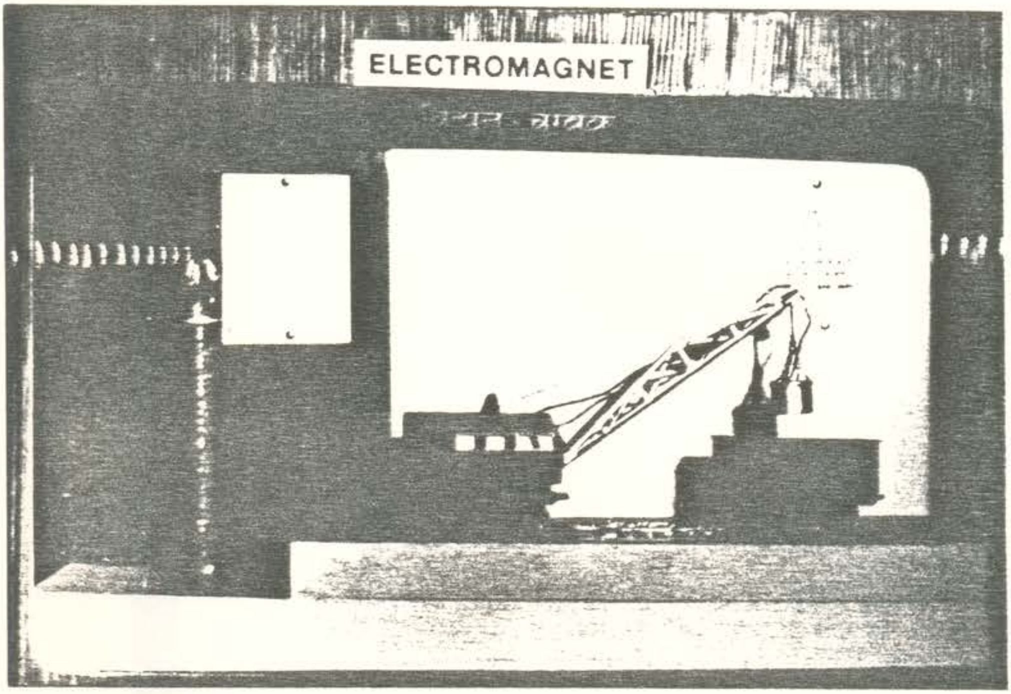


Exhibit No. 17 : Solar Energy also produces Electricity


SOLAR ENERGY ALSO PRODUCES ELECTRICITY
সৌরশক্তিও বিদ্যুৎ তৈরী কার

The exhibit gives us an idea about transformation of solar energy (in the form of Sun's rays) into electricity by means of solar cells which are used to operate instruments in space satellites. The power produced by these cells is small.

Exhibit No. 18 : Electromagnet

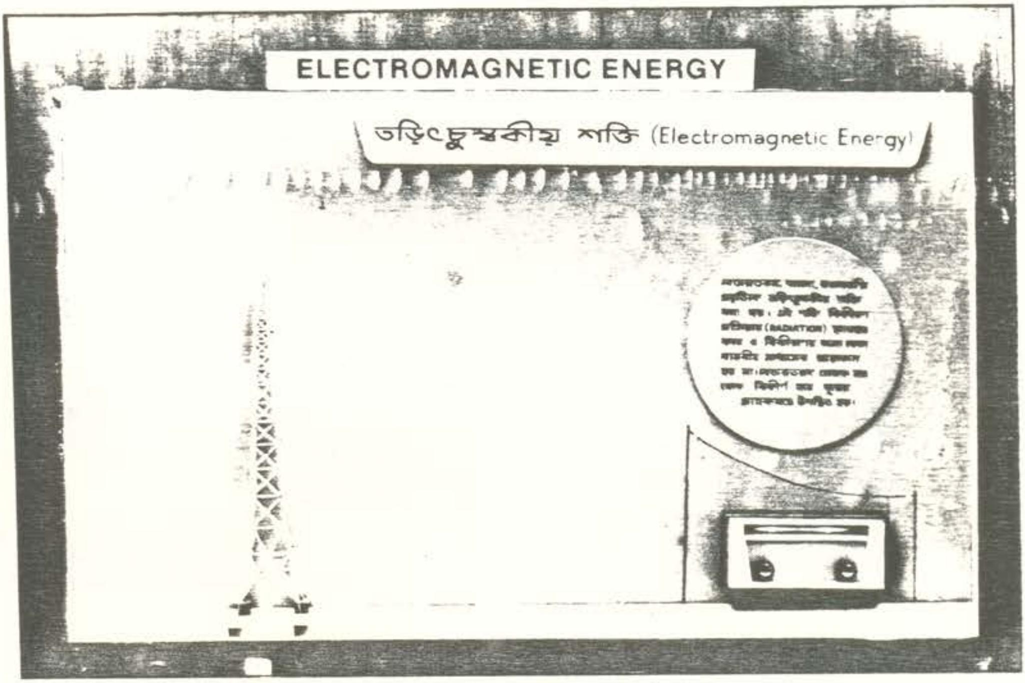


When a piece of soft iron is placed inside a coil of wire through which an electric current flows, it becomes a magnet. It retains magnetic property so long as direct current flows through the coil.

Powerful cranes to carry heavy materials from place to place are made by using electromagnets.

Here the exhibit shows all these phenomena.

Exhibit No.19 : Electromagnetic Energy



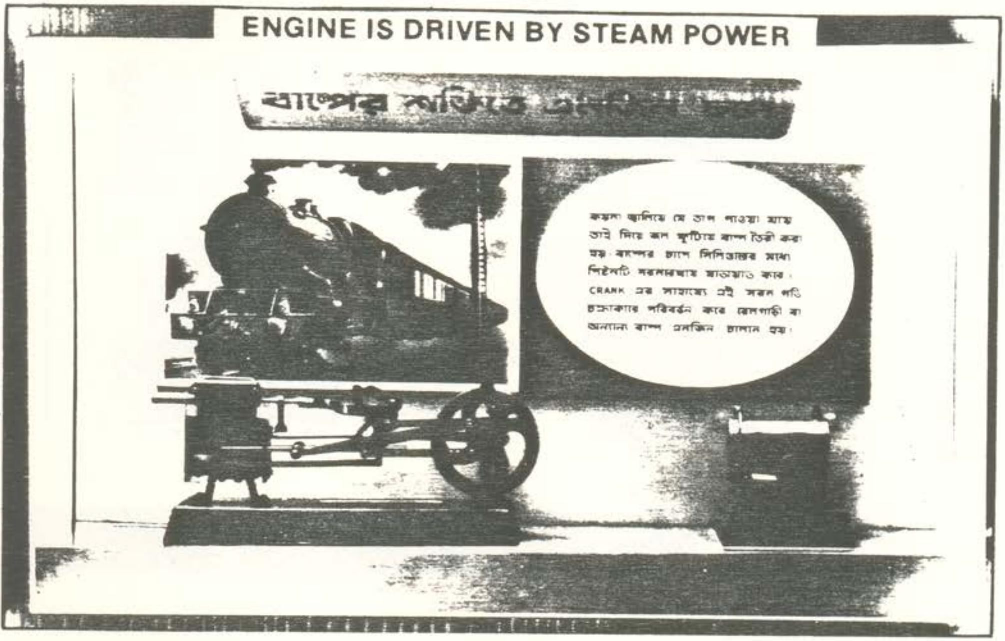
Radio waves, light, X-rays etc. are called electromagnetic energy which is transported from one place to another by means of radiation and do not require any airy medium for this purpose. By light animation how radio waves are radiated from the transmitter and reaches the receiver at a distance, is exhibited here.

Exhibit No. 20 : Chemical Energy

Battery produces electricity by means of chemical combination in presence of special kinds of chemicals. The stored chemical energy is exhausted after a few days.

Here the exhibit shows by light animation, how the stored chemical energy in a battery is used up due to production of electricity and how it regains the chemical energy if an electric current is passed through it.

Exhibit No. 21 : Engine Is Driven By Steam Power

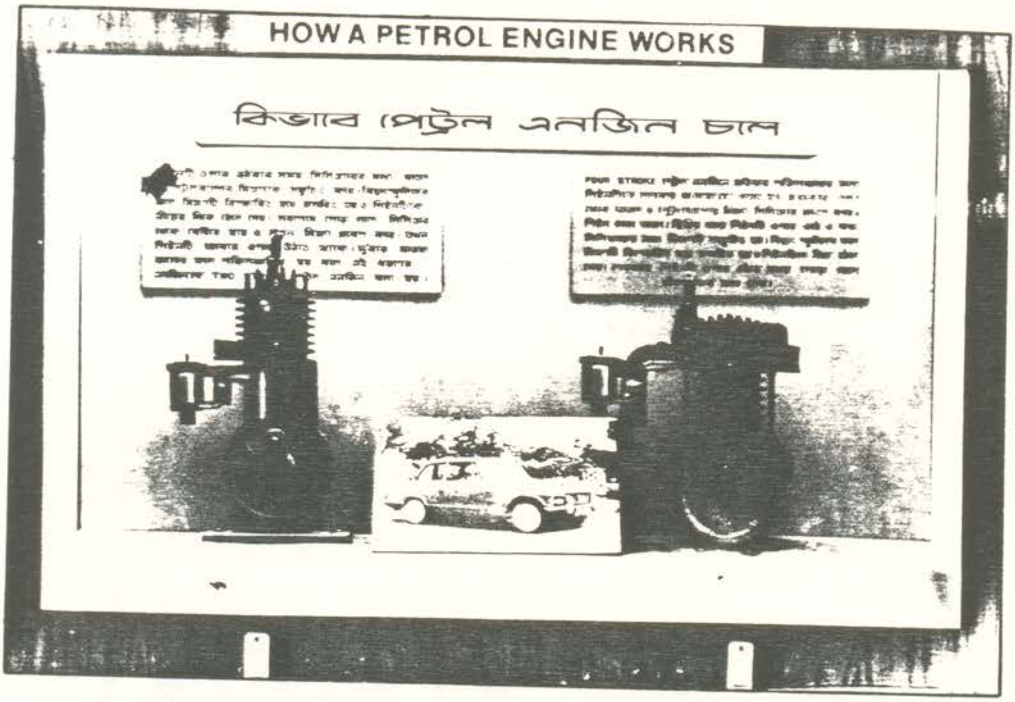


কয়লা জ্বালিয়ে যে তাপ পাওয়া যায় তাই দিয়ে জল ফুটিয়ে বাষ্প তৈরী করা হয়। বাষ্পের চাপে সিলিণ্ডারের মধ্যে পিষ্টনটি সরলরেখায় যাতায়াত করে। CRANK এর সাহায্যে এই সরল গতি চক্রাকার পরিবর্তন করে রেলগাড়ি বা অন্যান্য বাষ্প এনজিন চালান হয়।

When water is boiled by means of heat, steam is obtained and the pressure of the steam helps to move the piston in straight line inside the cylinder of the engine. Railway and other engines are driven by converting this linear motion into circular motion.

Here all these functions have been shown by means of two small steam engine models.

Exhibit No. 22 : How A Petrol Engine Works

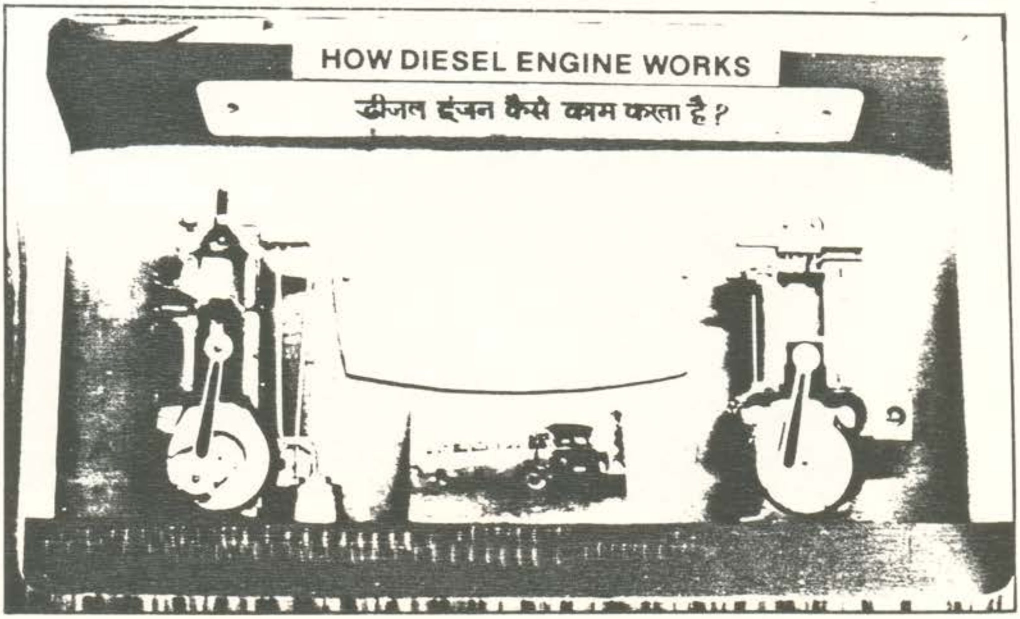


The piston, while moving up, compresses a mixture of air and petrol gas in the cylinder. The mixture is ignited by an electric spark and the burnt gas then expands and pushes the piston downward. Finally the burnt gas escapes from the cylinder and a new charge of mixture enters. The piston again moves up. Since power is imparted by two movements of the piston, this type of engine is called 'two stroke' engine.

In a 'four stroke' engine, the piston has to move four times to develop one complete cycle. Firstly a mixture of air and petrol gas enters the cylinder and the piston goes down. Secondly the piston moves up and the mixture is compressed. An electric spark and and expands the gas which pushes down the piston. Lastly the piston, while moving up, pushes out the burnt gas.

In this exhibit with two cut-sectional view, the functions of two stroke and four stroke engines have been demonstrated.

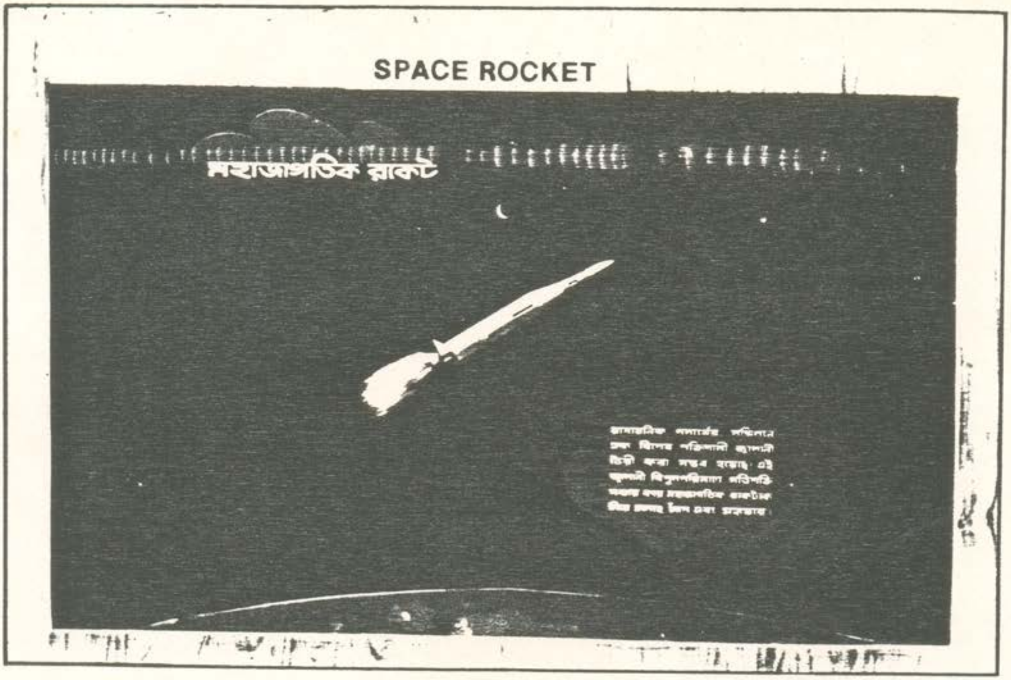
Exhibit No. 23 : How Diesel Engine Works



In a diesel engine air alone is introduced inside the cylinder. This air is compressed into a small volume and attains a high temperature. At this moment a fine spray of oil forced into the cylinder by a pump ignites spontaneously and the burnt gas on expansion drives the piston down. The piston moves twice in a 'two stroke' engine and four times in a 'four stroke' engine to develop energy each time.

This exhibit shows the working principle of a diesel engine with help of sectional views.

Exhibit No.24 : Space Rocket



A very powerful fuel can be obtained by means of a combination of some chemicals. This fuel produces huge quantity of motive power in rockets and takes them to the moon and the planets.

In this exhibit how this fuel produces motive power by its burning is shown by light animation.